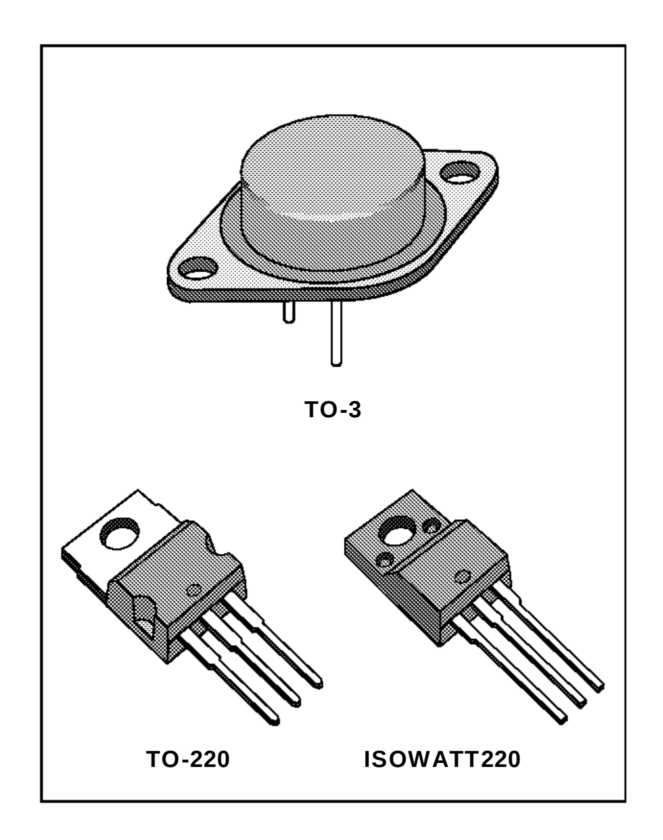
SGS-THOMSON MICROELECTRONICS

L7800 SERIES

POSITIVE VOLTAGE REGULATORS

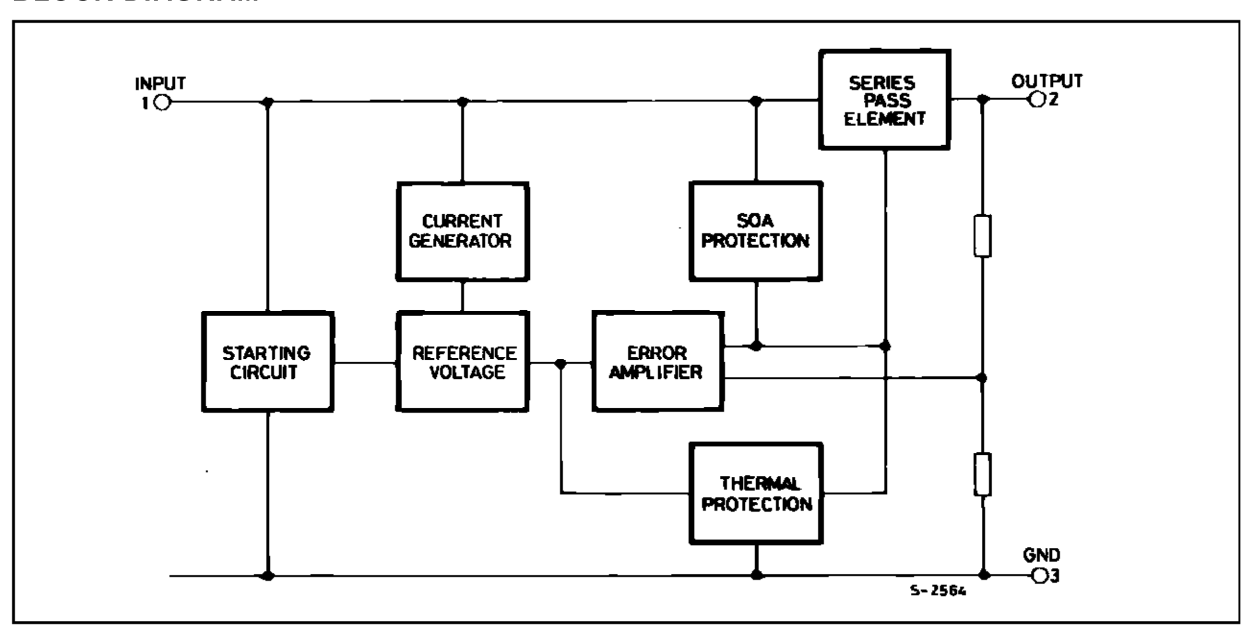
- OUTPUT CURRENT UP TO 1.5A
- OUTPUT VOLTAGES OF 5; 5.2; 6; 8; 8.5; 9; 12; 15; 18; 20; 24V
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION



DESCRIPTION

The L7800 series of three-terminal positive regulator is available in TO-220, ISOWATT220 and TO-3 packages and with several fixed output voltages making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

BLOCK DIAGRAM



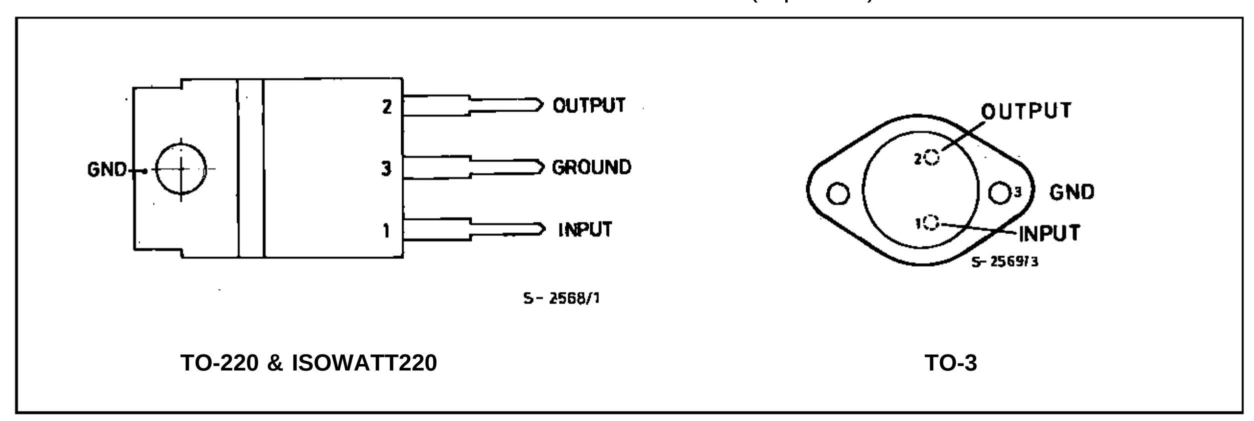
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_o = 5 to 18V) (for V_o = 20, 24V)	35 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Power Dissipation	Internally limited	
T_{op}	Operating Junction Temperature (for **L7800**) (for **L7800C**)	– 55 to + 150 0 to + 150	°C °C
T_{stg}	Storage Temperature	– 65 to + 150	°C

THERMAL DATA

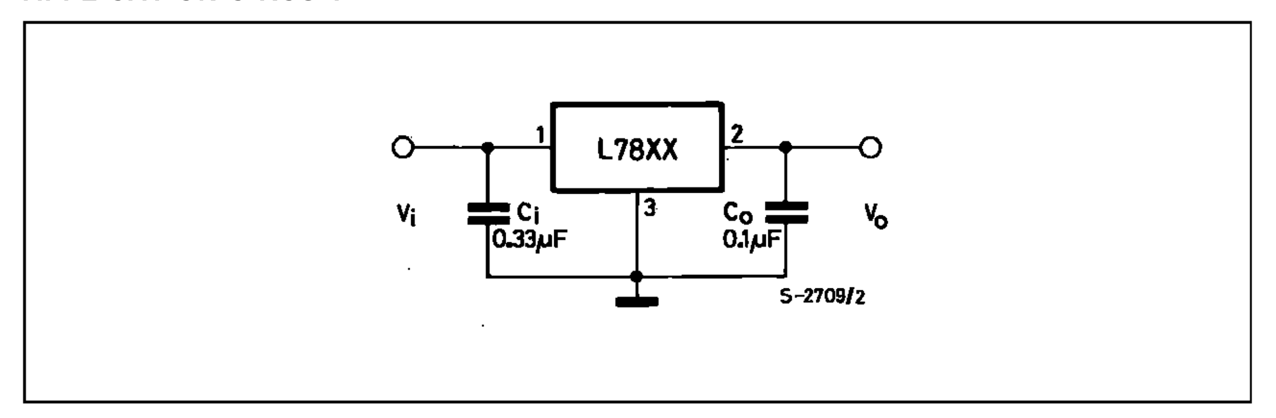
Symbol	Parameter		TO-220	ISOWATT220	TO-3	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	Max	3	4	4	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	50	60	35	°C/W

CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



Type	TO-220	ISOWATT220	TO-3	Output Voltage
L7805			L7805T	5V
L7805C	L7805CV	L7805CP	L7805CT	5V
L7852C	L7852CV	L7852CP	L7852CT	5.2V
L7806			L7806T	6V
L7806C	L7806CV	L7806CP	L7806CT	6V
L7808			L7808T	8V
L7808C	L7808CV	L7808CP	L7808CT	8V
L7885C	L7885CV	L7885CP	L7885CT	8.5V
L7809C	L7809CV	L7809CP	L7809CT	9V
L7812			L7812T	12V
L7812C	L7812CV	L7812CP	L7812CT	12V
L7815			L7815T	15V
L7815C	L7815CV	L7815CP	L7815CT	15V
L7818			L7818T	18V
L7818C	L7818CV	L7818CP	L7818CT	18V
L7820			L7820T	20V
L7820C	L7820CV	L7820CP	L7820CT	20V
L7824			L7824T	24V
L7824C	L7824CV	L7824CP	L7824CT	24V

APPLICATION CIRCUIT



SCHEMATIC DIAGRAM

TEST CIRCUITS

Figure 1 : DC Parameters.

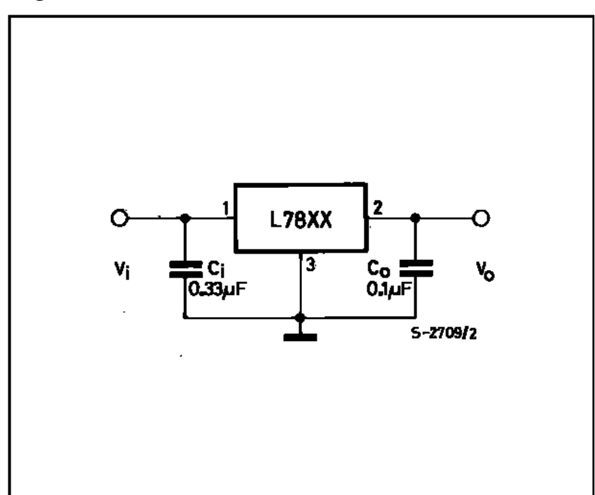


Figure 2 : Load Regulation.

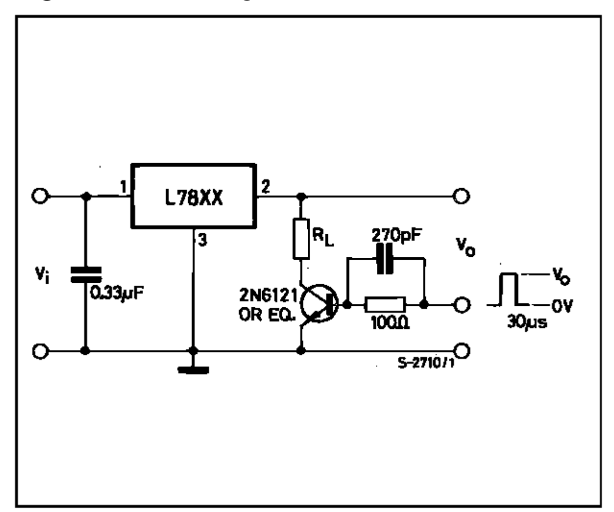
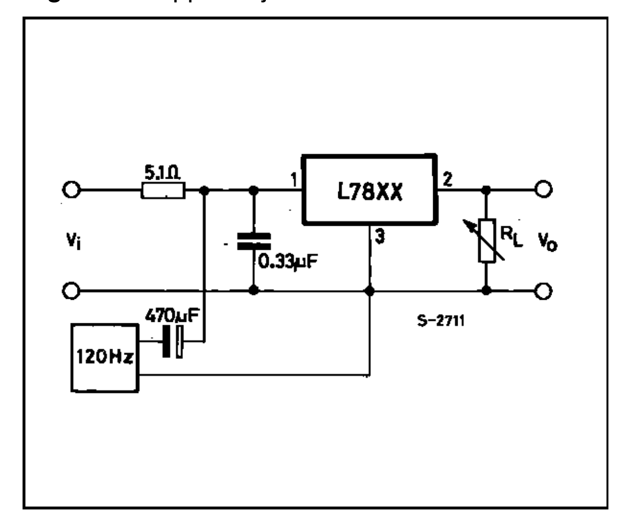


Figure 3 : Ripple Rejection.



ELECTRICAL CHARACTERISTICS FOR L7805 (refer to the test circuits, T_j = -55 to 150 ^oC, V_i = 10V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	4.8	5	5.2	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 8 to 20 V	4.65	5	5.35	V
ΔV_o*	Line Regulation	V_i = 7 to 25 V T_j = 25 ^oC V_i = 8 to 12 V T_j = 25 ^oC		3 1	50 25	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			100 25	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		0.6		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC			40	μV/V_O
SVR	Supply Voltage Rejection	V_i = 8 to 18 V f = 120 Hz	68			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2	2.5	V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7806 (refer to the test circuits, T_j = -55 to 150 ^oC, V_i = 15V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	5.75	6	6.25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 9 to 21 V	5.65	6	6.35	V
ΔV_o*	Line Regulation	V_i = 8 to 25 V T_j = 25 ^oC V_i = 9 to 13 V T_j = 25 ^oC			60 30	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			100 30	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 9 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		0.7		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC			40	μV/V_O
SVR	Supply Voltage Rejection	V_i = 9 to 19 V f = 120 Hz	65			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2	2.5	V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC	1.3	2.2	3.3	A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7808 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 14V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	7.7	8	8.3	V
V_o	Output Voltage	I_o = 5 mA to 1 A P_o ≤ 15 W V_i = 11.5 to 23 V	7.6	8	8.4	V
ΔV_o*	Line Regulation	V_i = 10.5 to 25 V T_j = 25 °C V_i = 11 to 17 V T_j = 25 °C			80 40	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 40	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 11.5 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 11.5 to 21.5 V f = 120 Hz	62			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7812 (refer to the test circuits, T_j = -55 to 150 °C, V_i = 19V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	11.5	12	12.5	V
V_o	Output Voltage	I_o = 5 mA to 1 A P_o ≤ 15 W V_i = 15.5 to 27 V	11.4	12	12.6	V
ΔV_o*	Line Regulation	V_i = 14.5 to 30 V T_j = 25 °C V_i = 16 to 22 V T_j = 25 °C			120 60	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 60	mV mV
I_d	Quiescent Current	T_j = 25 °C			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 15 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		1.5		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C			40	µV/V_O
SVR	Supply Voltage Rejection	V_i = 15 to 25 V f = 120 Hz	61			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2	2.5	V
R_o	Output Resistance	f = 1 KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 °C	1.3	2.2	3.3	A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7815 (refer to the test circuits, T_j = -55 to 150 ^oC, V_i = 23V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	14.4	15	15.6	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 18.5 to 30 V	14.25	15	15.75	V
ΔV_o*	Line Regulation	V_i = 17.5 to 30 V T_j = 25 ^oC V_i = 20 to 26 V T_j = 25 ^oC			150 75	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			150 75	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 18.5 to 30 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		1.8		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC			40	μV/V_O
SVR	Supply Voltage Rejection	V_i = 18.5 to 28.5 V f = 120 Hz	60			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2	2.5	V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7818 (refer to the test circuits, T_j = -55 to 150 ^oC, V_i = 26V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	17.3	18	18.7	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 22 to 33 V	17.1	18	18.9	V
ΔV_o*	Line Regulation	V_i = 21 to 33 V T_j = 25 ^oC V_i = 24 to 30 V T_j = 25 ^oC			180 90	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			180 90	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 22 to 33 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		2.3		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC			40	μV/V_O
SVR	Supply Voltage Rejection	V_i = 22 to 32 V f = 120 Hz	59			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2	2.5	V
R_o	Output Resistance	f = 1 KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC	1.3	2.2	3.3	A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7820 (refer to the test circuits, T_j = -55 to 150 ^oC, V_i = 28V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	19.2	20	20.8	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 24 to 35 V	19	20	21	V
ΔV_o*	Line Regulation	V_i = 22.5 to 35 V T_j = 25 ^oC V_i = 26 to 32 V T_j = 25 ^oC			200 100	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			200 100	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 24 to 35 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		2.5		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC			40	μV/V_O
SVR	Supply Voltage Rejection	V_i = 24 to 35 V f = 120 Hz	58			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2	2.5	V
R_o	Output Resistance	f = 1 KHz		24		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC	1.3	2.2	3.3	A

ELECTRICAL CHARACTERISTICS FOR L7824 (refer to the test circuits, T_j = -55 to 150 ^oC, V_i = 33V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	23	24	25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 28 to 38 V	22.8	24	25.2	V
ΔV_o*	Line Regulation	V_i = 27 to 38 V T_j = 25 ^oC V_i = 30 to 36 V T_j = 25 ^oC			240 120	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			240 120	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			6	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 28 to 38 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		3		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC			40	μV/V_O
SVR	Supply Voltage Rejection	V_i = 28 to 38 V f = 120 Hz	56			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2	2.5	V
R_o	Output Resistance	f = 1 KHz		28		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		0.75	1.2	A
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC	1.3	2.2	3.3	A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7805C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 10V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	4.8	5	5.2	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 7 to 20 V	4.75	5	5.25	V
ΔV_o*	Line Regulation	V_i = 7 to 25 V T_j = 25 °C V_i = 8 to 12 V T_j = 25 °C		3 1	100 50	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			100 50	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 7 to 25 V			0.8	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		40		µV
SVR	Supply Voltage Rejection	V_i = 8 to 18 V f = 120 Hz	62			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		750		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7852C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 10V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	5.0	5.2	5.4	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 8 to 20 V	4.95	5.2	5.45	V
ΔV_o*	Line Regulation	V_i = 7 to 25 V T_j = 25 °C V_i = 8 to 12 V T_j = 25 °C		3 1	105 52	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			105 52	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 7 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.0		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		42		µV
SVR	Supply Voltage Rejection	V_i = 8 to 18 V f = 120 Hz	61			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		750		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7806C (refer to the test circuits, T_j = 0 to 125 ^oC, V_i = 11V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	5.75	6	6.25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 8 to 21 V	5.7	6	6.3	V
ΔV_o*	Line Regulation	V_i = 8 to 25 V T_j = 25 ^oC V_i = 9 to 13 V T_j = 25 ^oC			120 60	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			120 60	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 8 to 25 V			1.3	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/^{o}C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC		45		µV
SVR	Supply Voltage Rejection	V_i = 9 to 19 V f = 120 Hz	59			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2		V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		550		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7808C (refer to the test circuits, T_j = 0 to 125 ^oC, V_i = 14V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	7.7	8	8.3	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 10.5 to 25 V	7.6	8	8.4	V
ΔV_o*	Line Regulation	V_i = 10.5 to 25 V T_j = 25 ^oC V_i = 11 to 17 V T_j = 25 ^oC			160 80	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			160 80	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 10.5 to 25 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/^{o}C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC		52		µV
SVR	Supply Voltage Rejection	V_i = 11.5 to 21.5 V f = 120 Hz	56			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2		V
R_o	Output Resistance	f = 1 KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		450		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC		2.2		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7885C (refer to the test circuits, T_j = 0 to 125 ^oC, V_i = 14.5V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	8.2	8.5	8.8	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 11 to 26 V	8.1	8.5	8.9	V
ΔV_o*	Line Regulation	V_i = 11 to 27 V T_j = 25 ^oC V_i = 11.5 to 17.5 V T_j = 25 ^oC			160 80	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			160 80	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 11 to 27 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-0.8		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC		55		μV
SVR	Supply Voltage Rejection	V_i = 12 to 22 V f = 120 Hz	56			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2		V
R_o	Output Resistance	f = 1 KHz		16		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		450		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7809C (refer to the test circuits, T_j = 0 to 125 ^oC, V_i = 15V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	8.65	9	9.35	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 11.5 to 26 V	8.55	9	9.45	V
ΔV_o*	Line Regulation	V_i = 11.5 to 26 V T_j = 25 ^oC V_i = 12 to 18 V T_j = 25 ^oC			180 90	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			180 90	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 11.5 to 26 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.0		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC		70		μV
SVR	Supply Voltage Rejection	V_i = 12 to 23 V f = 120 Hz	55			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2		V
R_o	Output Resistance	f = 1 KHz		17		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		400		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC		2.2		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7812C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 19V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	11.5	12	12.5	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 14.5 to 27 V	11.4	12	12.6	V
ΔV_o*	Line Regulation	V_i = 14.5 to 30 V T_j = 25 °C V_i = 16 to 22 V T_j = 25 °C			240 120	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			240 120	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 14.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		75		µV
SVR	Supply Voltage Rejection	V_i = 15 to 25 V f = 120 Hz	55			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		18		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		350		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.2		A

ELECTRICAL CHARACTERISTICS FOR L7815C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 23V, I_o = 500 mA, C_i = 0.33 µF, C_o = 0.1 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	14.4	15	15.6	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 17.5 to 30 V	14.25	15	15.75	V
ΔV_o*	Line Regulation	V_i = 17.5 to 30 V T_j = 25 °C V_i = 20 to 26 V T_j = 25 °C			300 150	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			300 150	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 17.5 to 30 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		90		µV
SVR	Supply Voltage Rejection	V_i = 18.5 to 28.5 V f = 120 Hz	54			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		19		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		230		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.1		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7818C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 26V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	17.3	18	18.7	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 21 to 33 V	17.1	18	18.9	V
ΔV_o*	Line Regulation	V_i = 21 to 33 V T_j = 25 °C V_i = 24 to 30 V T_j = 25 °C			360 180	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			360 180	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 21 to 33 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		110		μV
SVR	Supply Voltage Rejection	V_i = 22 to 32 V f = 120 Hz	53			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		22		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		200		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.1		A

ELECTRICAL CHARACTERISTICS FOR L7820C (refer to the test circuits, T_j = 0 to 125 °C, V_i = 28V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 °C	19.2	20	20.8	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 23 to 35 V	19	20	21	V
ΔV_o*	Line Regulation	V_i = 22.5 to 35 V T_j = 25 °C V_i = 26 to 32 V T_j = 25 °C			400 200	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 °C I_o = 250 to 750 mA T_j = 25 °C			400 200	mV mV
I_d	Quiescent Current	T_j = 25 °C			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 23 to 35 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1		mV/°C
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 °C		150		μV
SVR	Supply Voltage Rejection	V_i = 24 to 35 V f = 120 Hz	52			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 °C		2		V
R_o	Output Resistance	f = 1 KHz		24		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 °C		180		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 °C		2.1		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

ELECTRICAL CHARACTERISTICS FOR L7824C (refer to the test circuits, T_j = 0 to 125 ^oC, V_i = 33V, I_o = 500 mA, C_i = 0.33 μF, C_o = 0.1 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	T_j = 25 ^oC	23	24	25	V
V_o	Output Voltage	I_o = 5 mA to 1 A $P_o \leq$ 15 W V_i = 27 to 38 V	22.8	24	25.2	V
ΔV_o*	Line Regulation	V_i = 27 to 38 V T_j = 25 ^oC V_i = 30 to 36 V T_j = 25 ^oC			480 240	mV mV
ΔV_o*	Load Regulation	I_o = 5 to 1500 mA T_j = 25 ^oC I_o = 250 to 750 mA T_j = 25 ^oC			480 240	mV mV
I_d	Quiescent Current	T_j = 25 ^oC			8	mA
ΔI_d	Quiescent Current Change	I_o = 5 to 1000 mA			0.5	mA
ΔI_d	Quiescent Current Change	V_i = 27 to 38 V			1	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift	I_o = 5 mA		-1.5		mV/^oC
eN	Output Noise Voltage	B = 10Hz to 100KHz T_j = 25 ^oC		170		μV
SVR	Supply Voltage Rejection	V_i = 28 to 38 V f = 120 Hz	50			dB
V_d	Dropout Voltage	I_o = 1 A T_j = 25 ^oC		2		V
R_o	Output Resistance	f = 1 KHz		28		mΩ
I_{sc}	Short Circuit Current	V_i = 35 V T_j = 25 ^oC		150		mA
I_{scp}	Short Circuit Peak Current	T_j = 25 ^oC		2.1		A

* Load and line regulation are specified at constant junction temperature. Changes in V_o due to heating effects must be taken into account separately. Pulce testing with low duty cycle is used.

Figure 4 : Dropout Voltage vs. Junction Temperature.

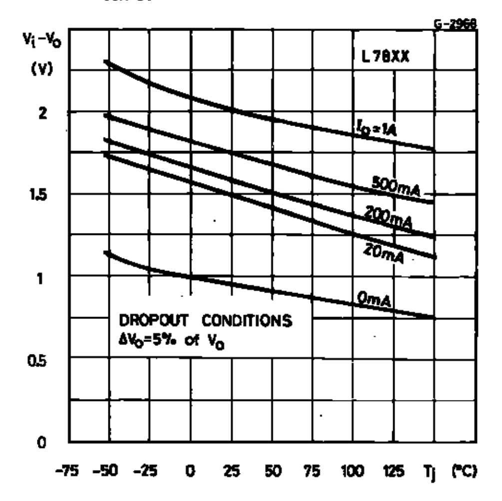


Figure 5 : Peak Output Current vs. Input/output Differential Voltage.

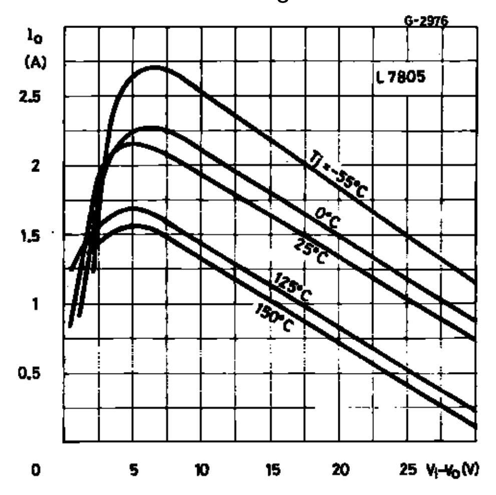


Figure 6 : Supply Voltage Rejection vs. Frequency.

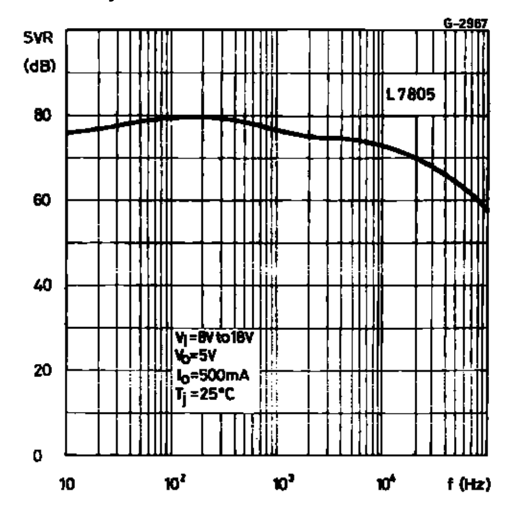


Figure 7 : Output Voltage vs. Junction Temperature.

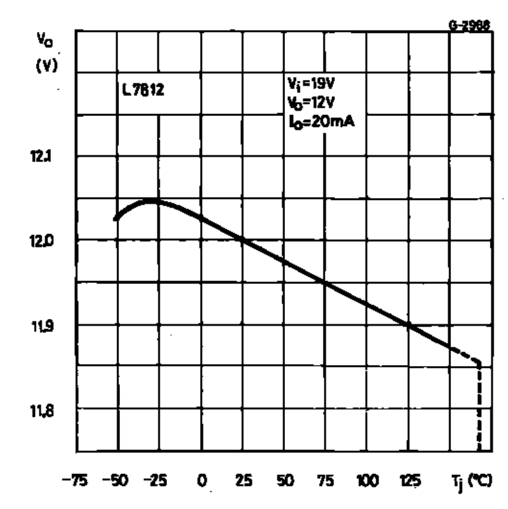


Figure 8 : Output Impedance vs. Frequency.

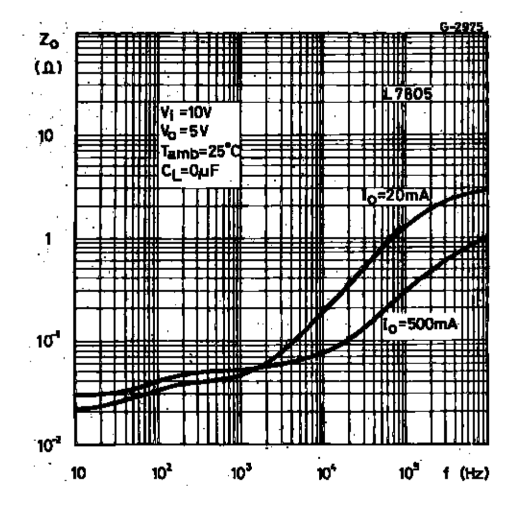


Figure 9 : Quiescent Current vs. Junction Temperature.

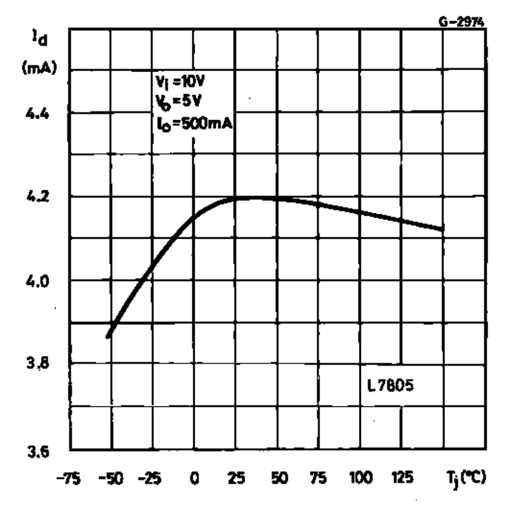


Figure 10 : Load Transient Response.

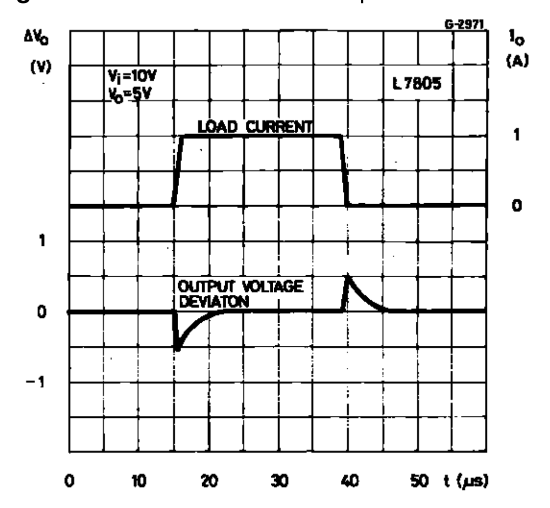


Figure 11 : Line Transient Response.

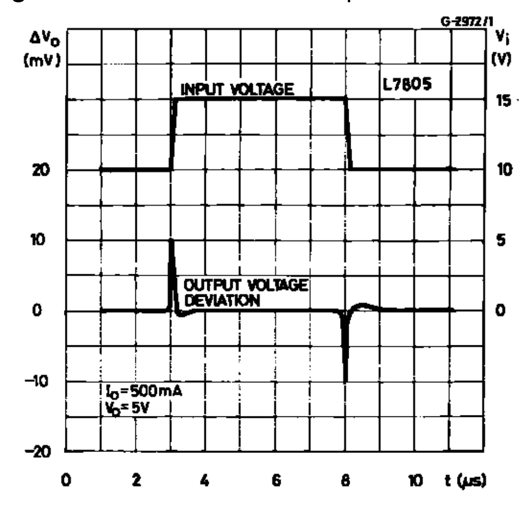


Figure 12 : Quiescent Current vs. Input Voltage.

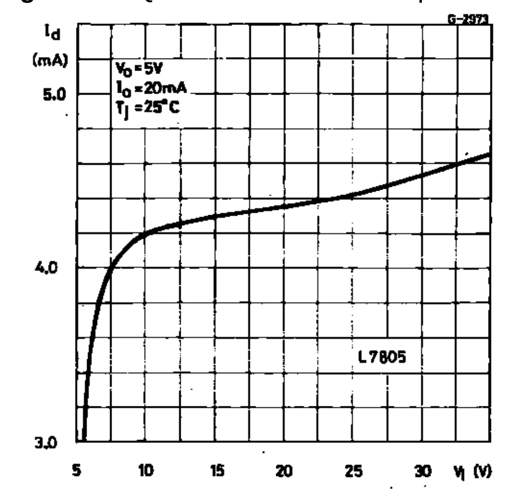
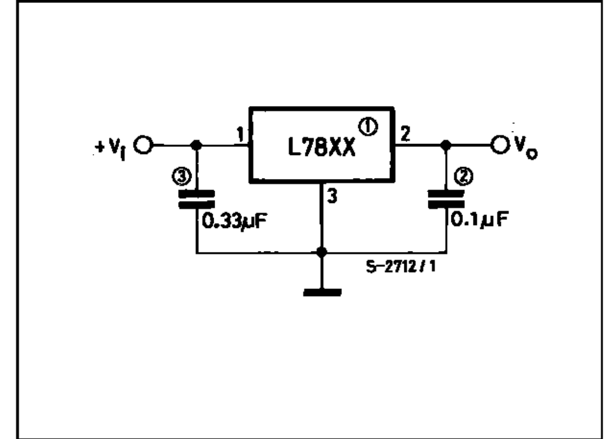
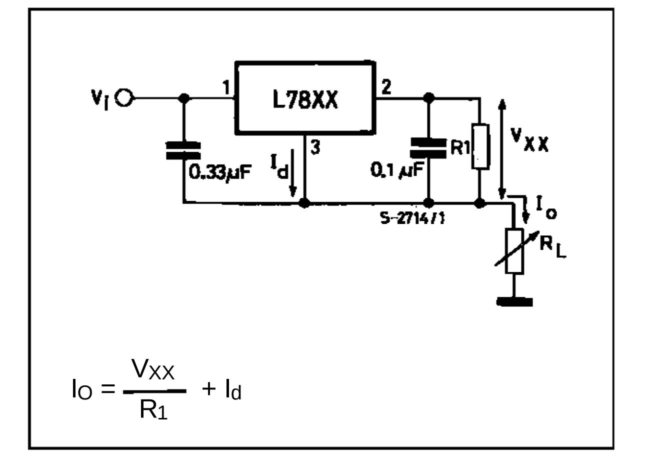


Figure 13 : Fixed Output Regulator.



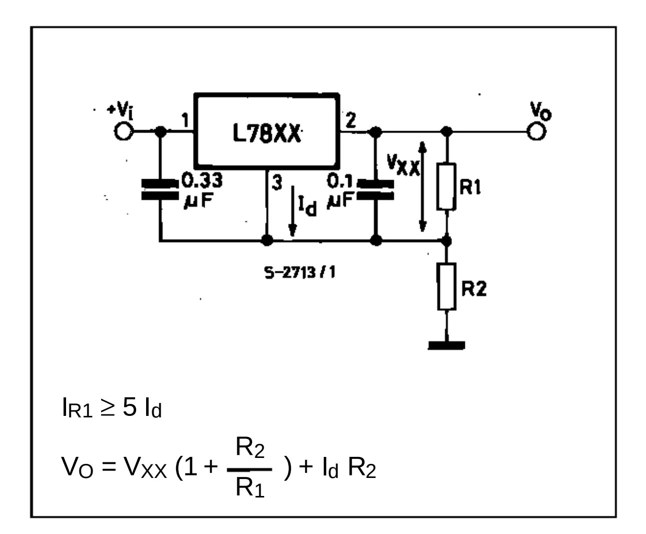
Notes : 1. To specify an output voltage, substitute voltage value for "XX".
2. Although no output capacitor is needed for stability, it does improve transient response.
3. Required if regulator is located an appreciable dis-tance from power supply filter.

Figure 14 : Current Regulator.



$$I_O = \frac{V_{XX}}{R_1} + I_d$$

Figure 15 : Circuit for Increasing Output Voltage.



$I_{R1} \geq 5\ I_d$

$$V_O = V_{XX}\left(1 + \frac{R_2}{R_1}\right) + I_d\,R_2$$

Figure 16 : Adjustable Output Regulator (7 to 30V).

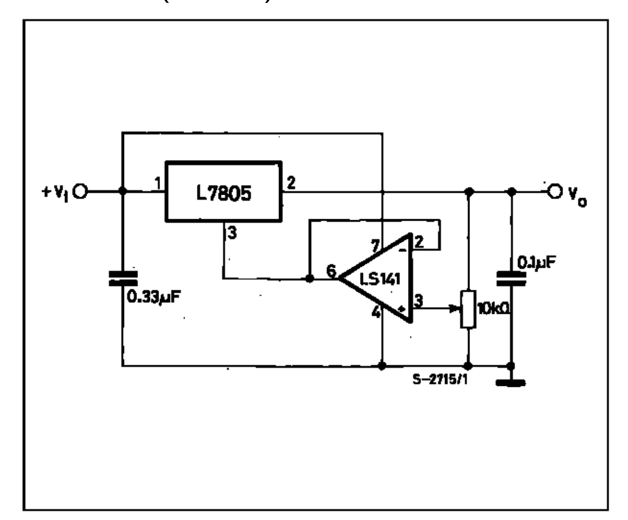
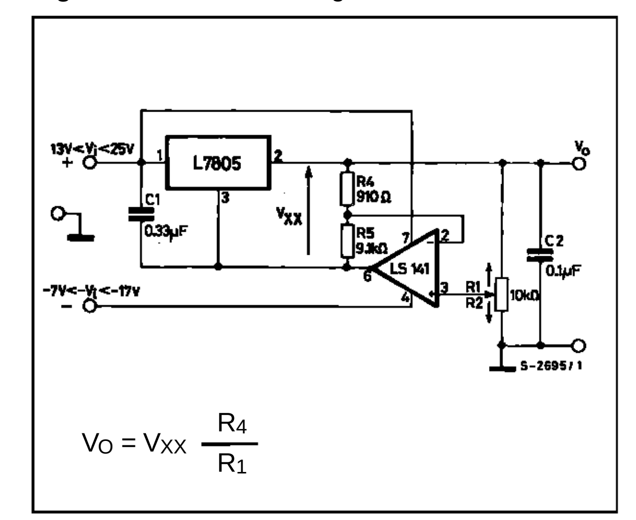
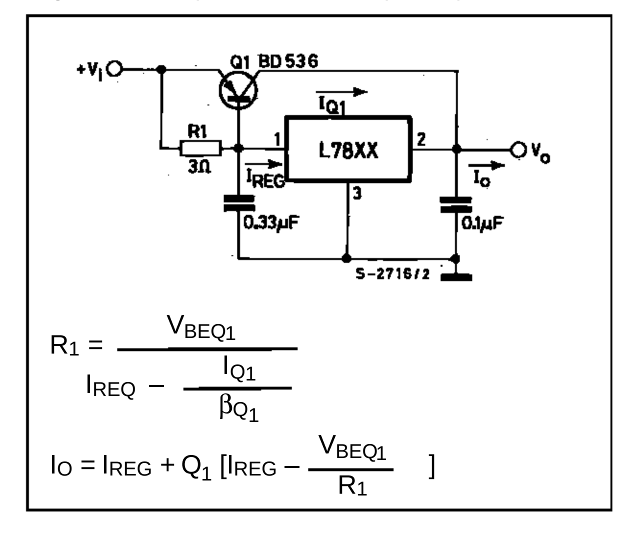


Figure 17 : 0.5 to 10V Regulator.



$$V_O = V_{XX}\,\frac{R_4}{R_1}$$

Figure 18 : High Current Voltage Regulator.



$$R_1 = \frac{V_{BEQ1}}{I_{REQ} - \dfrac{I_{Q1}}{\beta_{Q1}}}$$

$$I_O = I_{REG} + Q_1\left[I_{REG} - \frac{V_{BEQ1}}{R_1}\right]$$

Figure 19 : High Output Current with Short Circuit Protection.

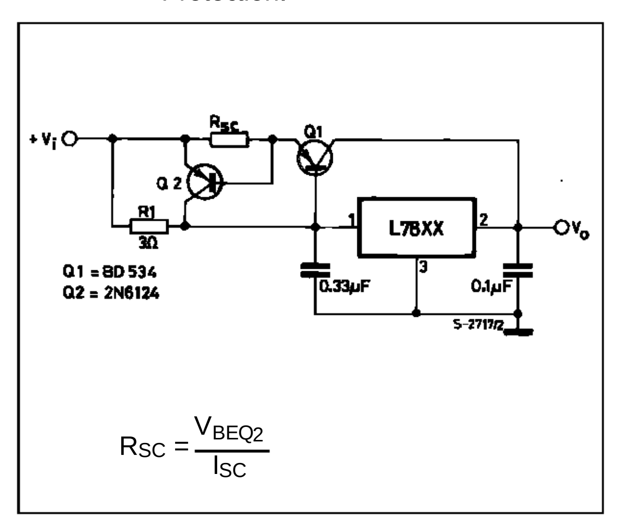


Figure 20 : Tracking Voltage Regulator.

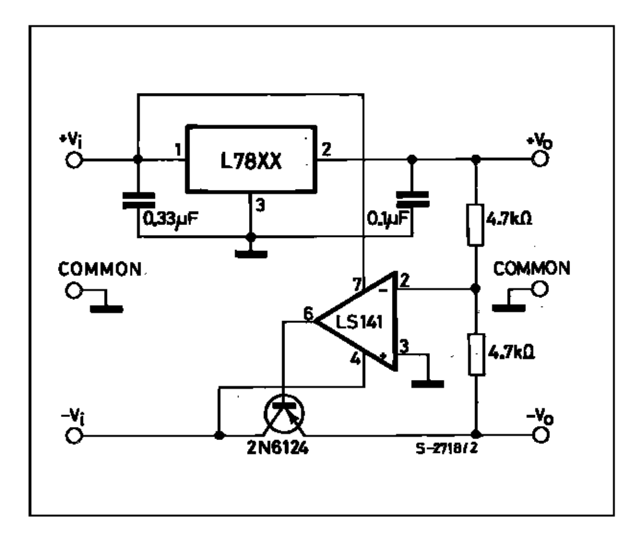
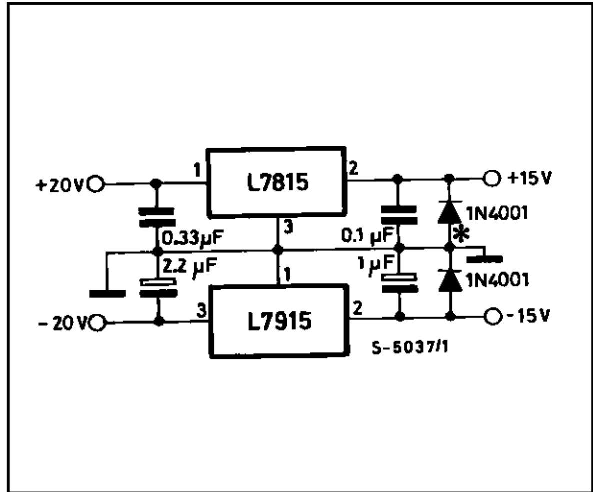


Figure 21 : Split Power Supply (± 15V – 1A).



* Against potential latch-up problems.

Figure 22 : Negative Output Voltage Circuit.

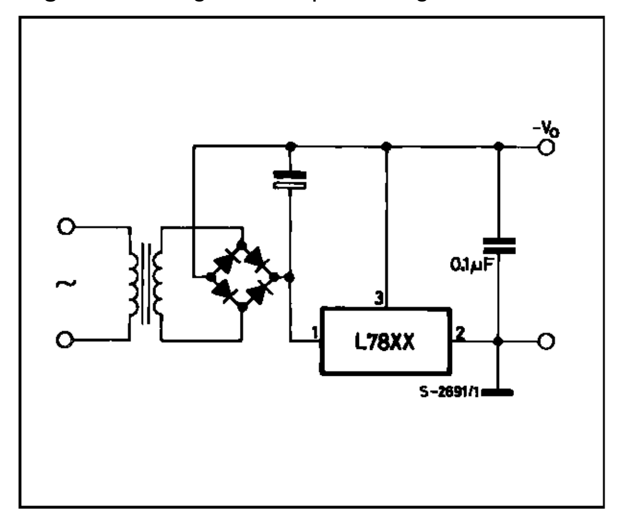


Figure 23 : Switching Regulator.

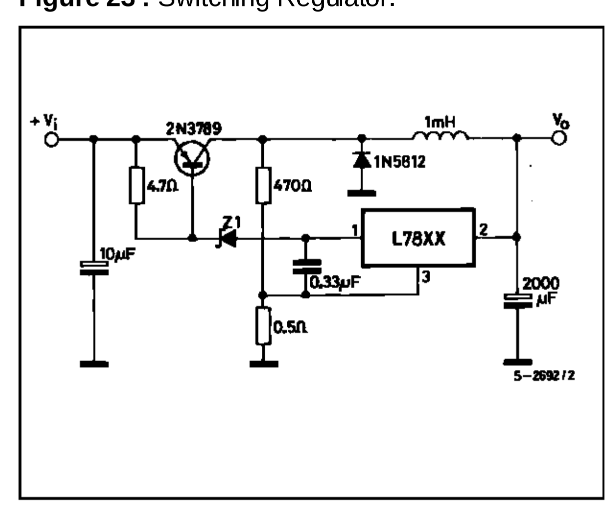


Figure 24 : High Input Voltage Circuit.

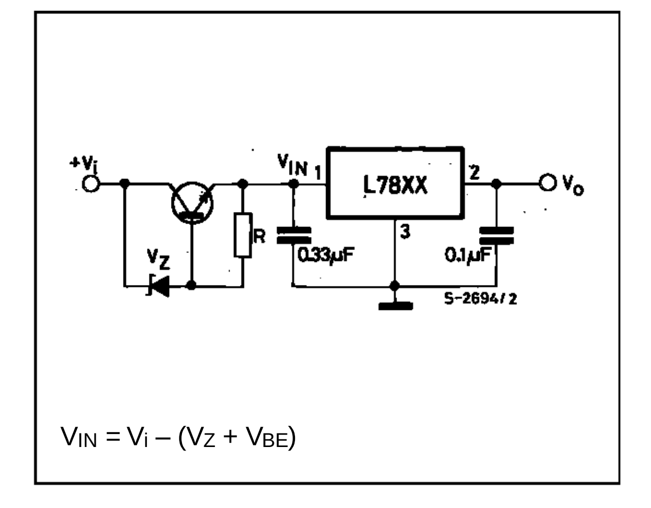


Figure 25 : High Input Voltage Circuit.

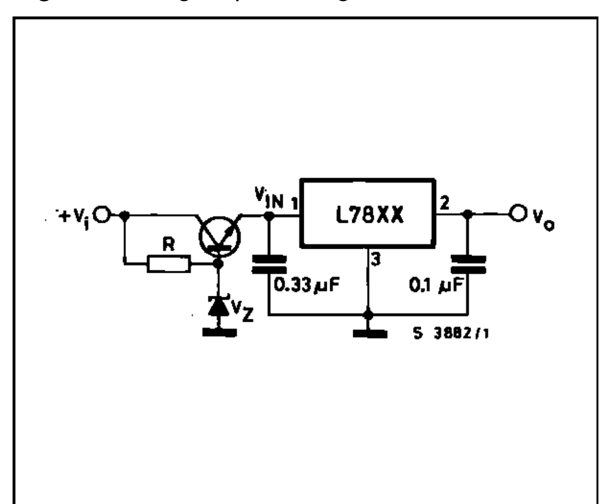


Figure 26 : High Output Voltage Regulator.

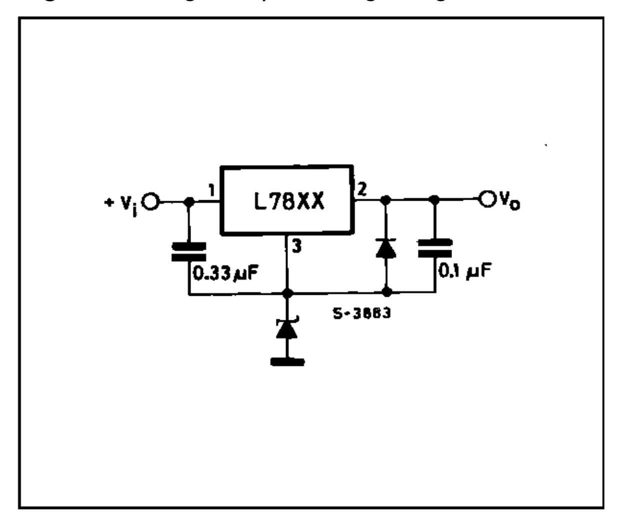
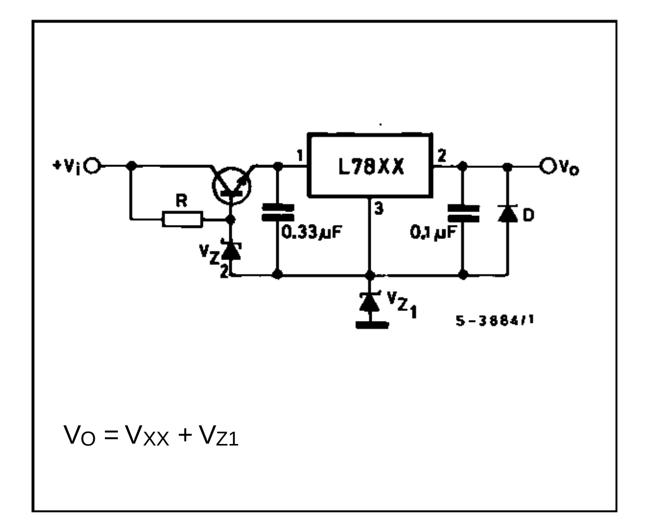
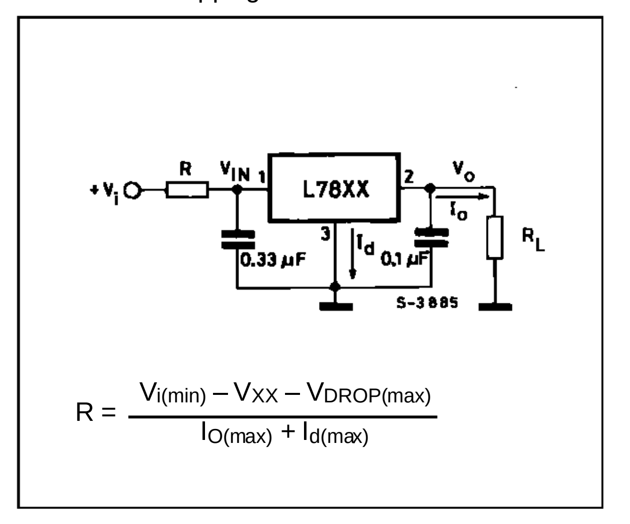


Figure 27 : High Input and Output Voltage.



$$V_O = V_{XX} + V_{Z1}$$

Figure 28 : Reducing Power Dissipation with Dropping Resistor.



$$R = \frac{V_{i(min)} - V_{XX} - V_{DROP(max)}}{I_{O(max)} + I_{d(max)}}$$

Figure 29 : Remote Shutdown.

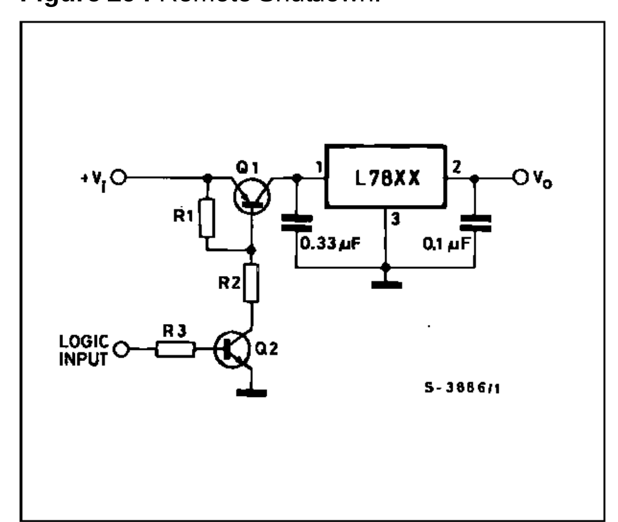
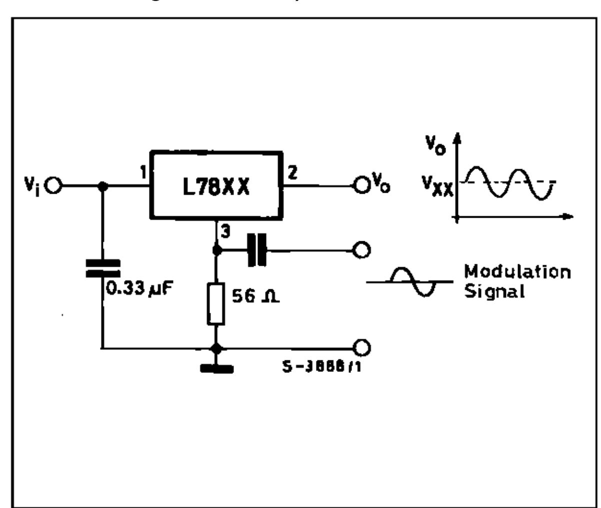
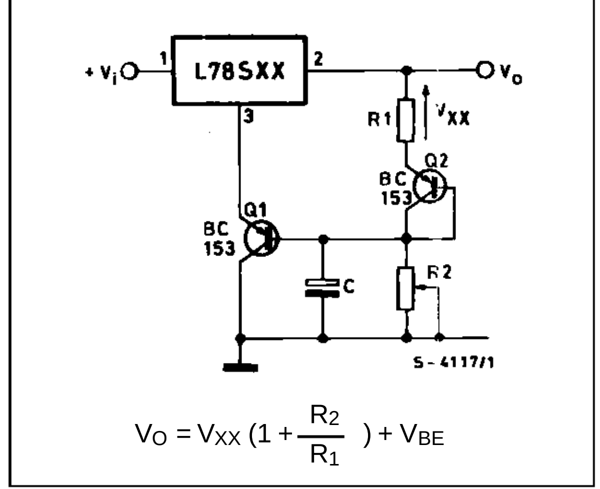


Figure 30 : Power AM Modulator (unity voltage gain, Io ≤ 1A).



Note : The circuit performs well up to 100KHz.

Figure 31 : Adjustable Output Voltage with Temperature Compensation.



$$V_O = V_{XX} \left(1 + \frac{R_2}{R_1}\right) + V_{BE}$$

Note : Q_2 is connected as a diode in order to compensate the variation of the Q_1 V_{BE} with the temperature. C allows a slow rise-time of the V_O

Figure 32 : Light Controllers ($V_{O\,min} = V_{XX} + V_{BE}$).

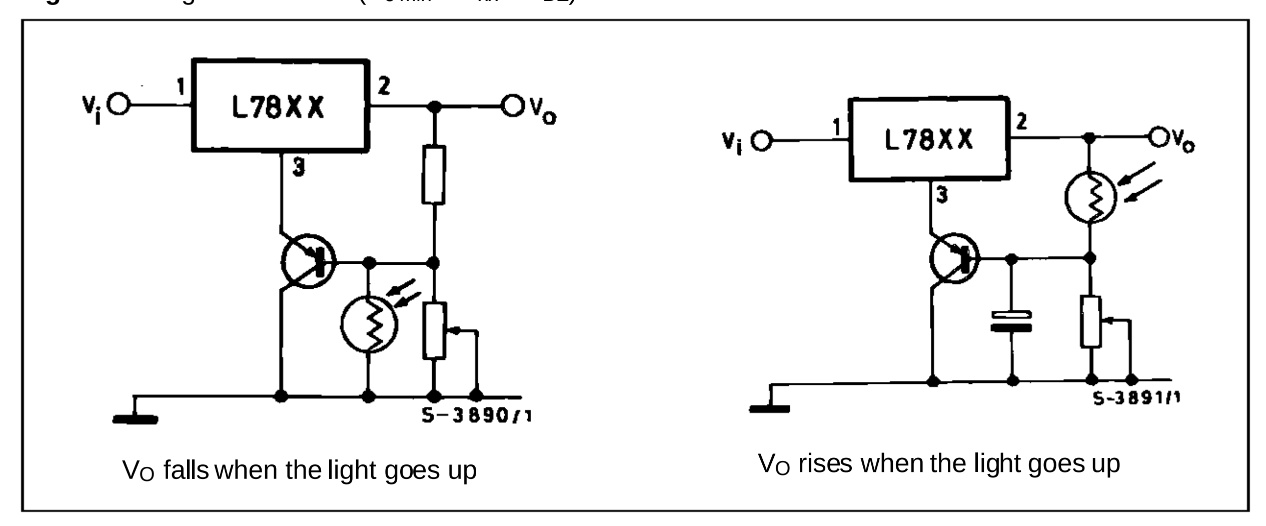
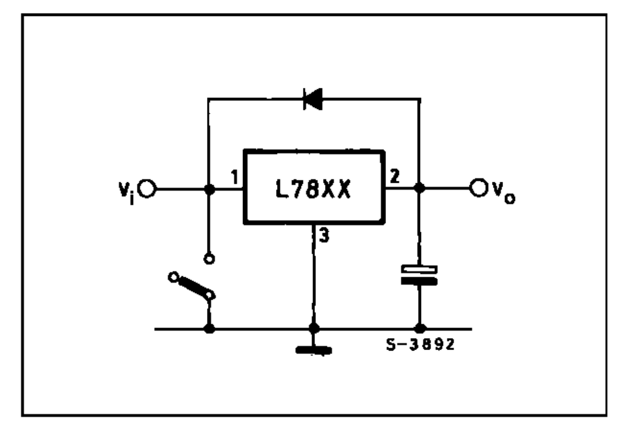


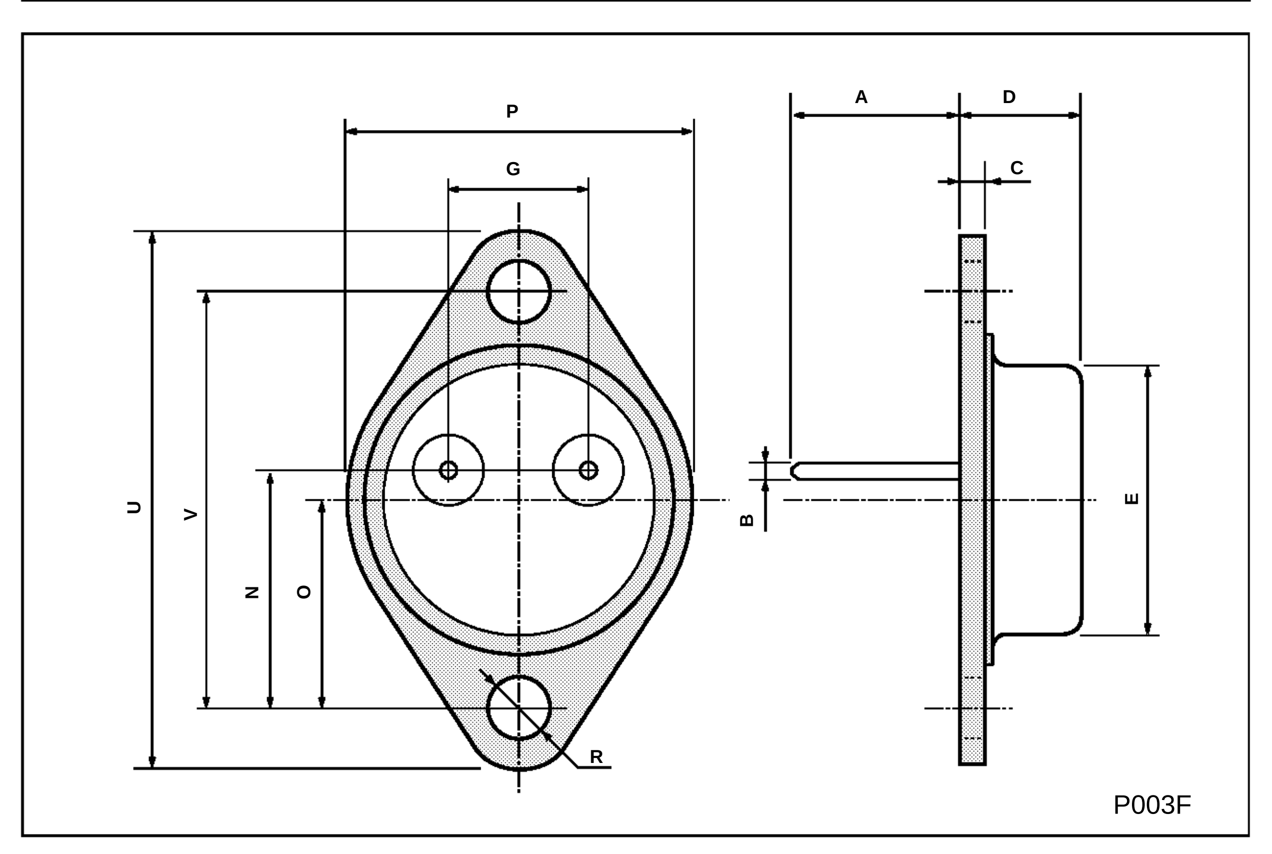
Figure 33 : Protection against Input Short-circuit with High Capacitance Loads.



Applications with high capacitance loads and an output voltage greater than 6 volts need an external diode (see fig. 33) to protect the device against input short circuit. In this case the input voltage falls rapidly while the output voltage decreases showly. The capacitance discharges by means of the Base-Emitter junction of the series pass transistor in the regulator. If the energy is sufficiently high, the tran-sistor

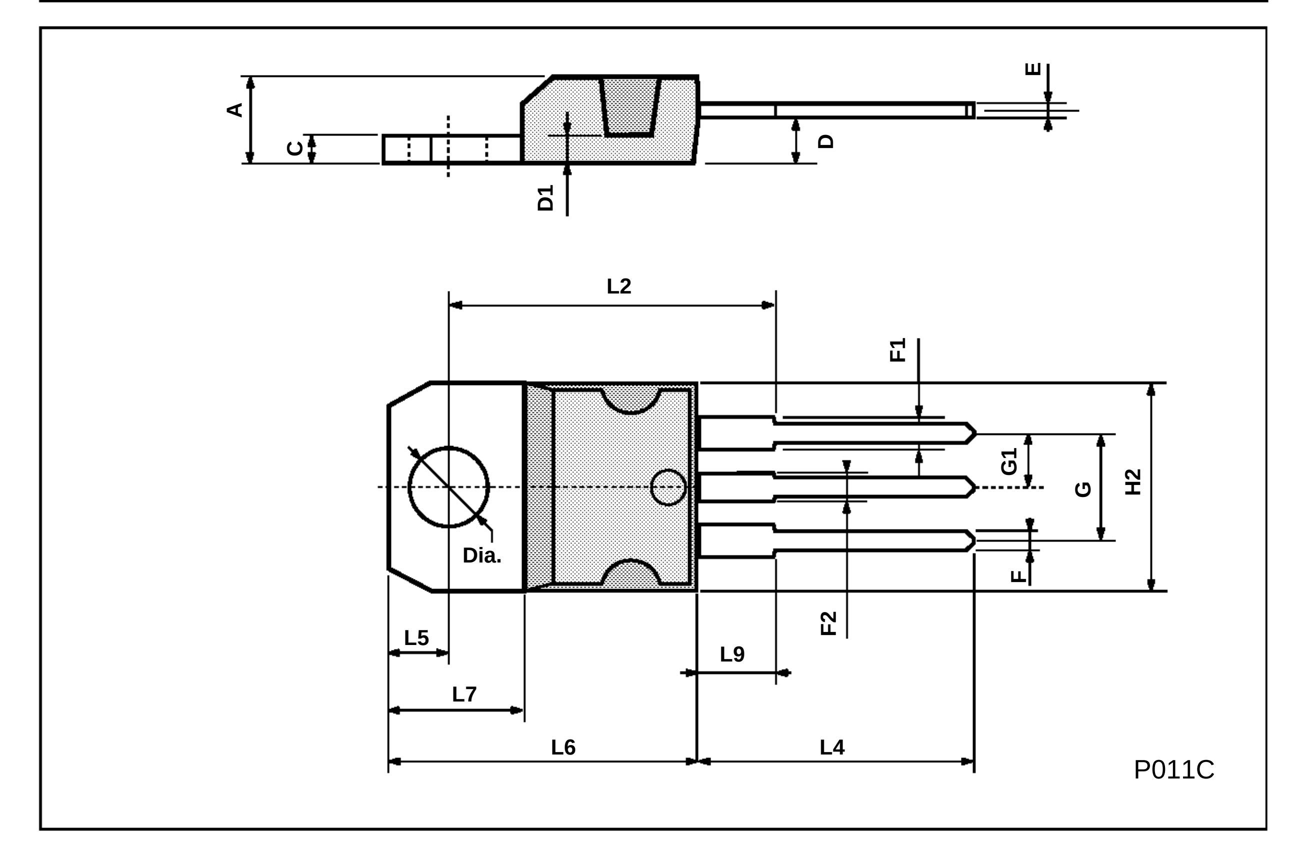
TO-3 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.00		13.10	0.433		0.516
B	0.97		1.15	0.038		0.045
C	1.50		1.65	0.059		0.065
D	8.32		8.92	0.327		0.351
E	19.00		20.00	0.748		0.787
G	10.70		11.10	0.421		0.437
N	16.50		17.20	0.649		0.677
P	25.00		26.00	0.984		1.023
R	4.00		4.09	0.157		0.161
U	38.50		39.30	1.515		1.547
V	30.00		30.30	1.187		1.193



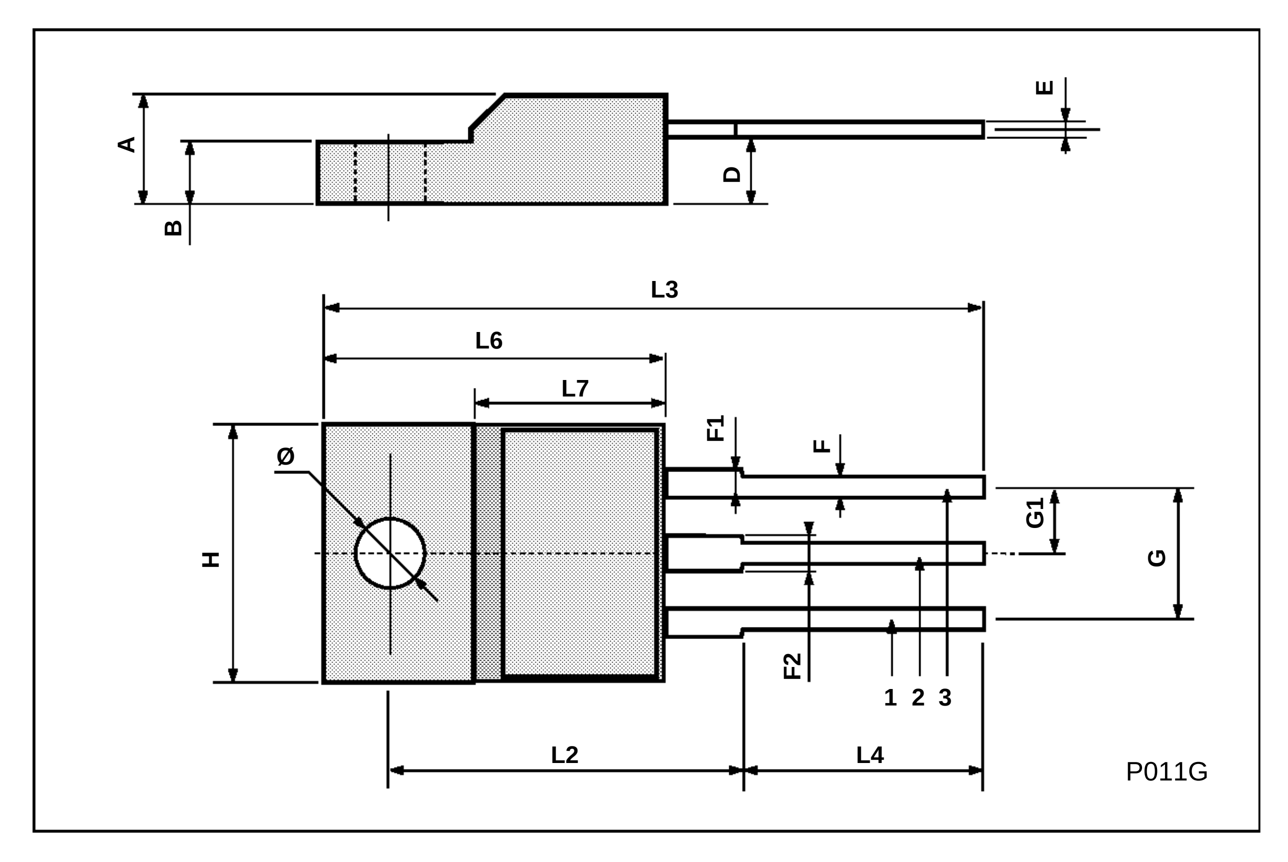
TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.2		15.9	0.598		0.625
L7	6.2		6.6	0.244		0.260
L9	3.5		4.2	0.137		0.165
DIA.	3.75		3.85	0.147		0.151



ISOWATT220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		3.66
Ø	3		3.2	0.118		0.126




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